

Kentucky's Pollinators on the Decline



Biennial Report
2015

**Kentucky State Nature Preserves
Commission**

KENTUCKY STATE NATURE PRESERVES COMMISSION MEMBERS

Mr. Adrian K. Arnold

Mt. Sterling, KY

Representing The Kentucky Farm Bureau Federation

Mr. Carl Breeding

Lexington, KY

Representing the State at-large

Mr. Peter E. Brown

Lexington, KY

Representing the State at-large

Mr. David W. Rowlett

Carrollton, KY

Representing the Soil Conservation Districts of Kentucky

Mrs. Shirley Trunnell

Utica, KY

Representing the National Farmers Organization

Donald S. Dott, Jr.

Executive Director

Kentucky State Nature Preserves Commission

801 Teton Trail, Frankfort KY 40601-1403

Telephone: 502-573-2886 / Fax: 502-573-2355

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**Biennial Report
of the
Kentucky State Nature Preserves Commission
January 2015**

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The biennial report is submitted to the Governor and the General Assembly as directed by KRS 146.410 et seq., the Kentucky State Nature Preserves Act, which established the Commission in 1976.

Welcome and Introduction

Across the Commonwealth decisions are made each day which impact nature's precious and rare plants, animals, and places...

...where to build a road, retail mall, or rural industrial site

...which acres of land to purchase for protection

...how to manage agricultural lands while improving habitat for pollinators

Each of these decisions can either *help conserve and protect* wildlife and natural ecosystems, or *accelerate their decline*. And each of these decisions is more likely to benefit nature when it is based on scientific information provided by the Kentucky State Nature Preserves Commission.

The Commission partners with state and federal agencies, universities, non-profits and individuals to make sure this scientific information is accurate, up-to-date, and shared with the people who need it.

We strive to track the location and assess the health of the highest priority wildlife and deliver that information to governments, companies, and the conservation community. Without it, decision-makers run the risk of using old, outdated information and ...

...building on breeding habitat or migratory stopovers of at-risk birds

...wasting money protecting lands that can no longer support key species

...missing opportunities to plan ahead in a world of changing climate

The Commission is a member in the NatureServe Network, which spans from **Canada to Latin America**, and engages **over 1000 scientific experts**. It is our mission to provide Kentucky and through the Network our neighbors in the Americas, the right information about which species are most at risk, and where they live. Together we can make threatened species and ecosystems more resilient, and ensure the beauty and **benefits** of our natural heritage for future generations.

Highlights of the Biennium

➤ Pollinator Conservation

It is widely known that both native bees and honey bees are **declining worldwide**. Yet Kentucky's native bee species are poorly known. Honey bees have long been recognized as good pollinators, leaving native bees overlooked, but often native bees are even better pollinators. Better pollination means an increase in yields and profits for farmers. The Commission has increased its ability to track pollinators by training an invertebrate biologist at the native bee course of the American Museum of Natural History. **We believe he is the only biologist in the state to complete this training.**

➤ Discovery Of A New Clover Species

Kentucky clover (*Trifolium kentuckiense*) is only the third plant species known to grow solely in Kentucky - and nowhere else in the world. It was confirmed in 2013 as "**new to science**". Though it's not actually "new under the sun", it is a species new to humans, and contains an individual genetic code with hidden possibilities.

➤ Two New State Nature Preserves

Archer-Benge SNP on Pine Mountain in Whitley County was dedicated to protect natural areas supporting federally listed mussels and a globally rare plant. Archer-Benge SNP is also part of one of the largest forest blocks in Kentucky. The second new preserve, Lone Oak Barrens in Grayson County, adds a limestone glade and an uncommonly diverse area of barrens and prairie. These two new preserves expanded your state nature preserve system by 1,897 acres.

➤ New Populations Discovered

Our biologists discovered five new rare species populations. Two other species which had not been seen in at least 20 years were "**rediscovered**". We also discovered two plant species not before known from Kentucky, increasing our knowledge of the flora around us upon which all life depends.

➤ **New On-Line Teaching Tool**

Through a partnership with **Kentucky Educational Television (KET)** teaching units based on the Commission's highly regarded publication; ***Kentucky's Natural Heritage, An Illustrated Guide to Biodiversity***, are now freely available to teachers and students via an interactive website.

The Commission achieved significant accomplishments in the last biennium despite the fact that we have lost **nine** permanent staff since 2008. These accomplishments attest to the perseverance and work ethic of the Commission's staff. The attrition has been in the Nature Preserves Stewardship Branch, reducing it from six permanent full-time staff to *only two*! It is an **IMPOSSIBLE task for two people to manage 64 state nature preserves** encompassing **27,663 acres**. The preserves include some of Kentucky's best known landmarks - Cumberland Falls, Natural Bridge, Blanton Forest, Bad Branch Falls, Pine Mountain State Park, the Kentucky River palisades, Audubon State Park, and Murphy's Pond among others. Years of work and investment in salaries, equipment, travel expenses and more are being erased. Imagine not mowing your lawn for a couple of years. Invasive weeds like kudzu retake areas that had been cleared of them, and prairie remnants convert to shrubby woodlands if not managed with prescribed fire. One word, **IMPOSSIBLE**, describes the task for *two* stewardship staff to manage 27,663 acres.

Our directive is to ensure the next generation in this Commonwealth has the same resources that we had available to us. Our toddlers will be living in a different world in 40 or 50 years, when our generation has faded into the past. They will need the same clean water, fresh air, medicinal and food resources which eons of genetic diversity have provided. Biologists worldwide agree we are in a period of unprecedented species extinction. Estimates on that pace differ—from 10 times to 1,000 times the historic rate—but the severity is beyond question: we are witnessing one of the greatest losses of biodiversity in Earth's history. It is not just the polar bears in the Arctic that are sliding toward extinction.

We need to do what we can, here in Kentucky to reduce our part of the losses. We can respond that we don't have the funding or manpower to address it now, knowing the worst effects will take years to manifest. But squandering the resources we have had access to will be

to the detriment of today's toddlers. Are the challenges daunting? Yes. Insurmountable? No! It's time to reinvigorate our environmental ethic! As with human health, preventative care is far less expensive and much more effective than trying to restore a faltering ecosystem.



Regal Fritillary butterfly

To keep every cog and wheel is the first precaution of intelligent tinkering.
- Aldo Leopold

Our Mission:

The Kentucky State Nature Preserves Commission protects Kentucky's natural heritage by:

1. Identifying, acquiring and managing natural areas that represent the best known natural occurrences of rare native species, natural communities and significant natural features in a statewide nature preserves system.
2. Working with others to protect biological diversity.
3. Educating Kentuckians as to the value and purpose of nature preserves and biodiversity preservation.



Monarch butterfly



Hummingbird
Clearwing
moth

I. STATE NATURE PRESERVES AND STEWARDSHIP:

The primary purpose of the state nature preserves system is to “secure for the people of present and future generations the benefits of an enduring resource of natural areas ...valuable as laboratories for scientific research, as reservoirs of natural materials not all of the uses of which are now known, as habitats for plant and animal species..., as living museums of the native landscape..., as places of scenic beauty, and as reminders of the **vital human dependence upon fresh air, clean water, and unspoiled natural areas.**” KRS 146.410. The Commission has been very effective in building a system of 64 state nature preserves. The two flagship state nature preserves are Blanton Forest, Kentucky’s largest old growth forest, and Bad Branch State Nature Preserve, the most diverse.

The **newest state nature preserve is Lone Oak Barrens** in Grayson County. It contains a unique limestone glade community with barrens/prairie remnants. There are few remaining high quality glades of this type in the state and they are a high priority for protection. A state threatened plant occurs in the glades and Kentucky’s best population of a globally rare species is found here.

The Commission manages 64 preserves containing 27,663 acres:

- of 343 plant species listed as state endangered, threatened or special concern, 143 are protected in perpetuity on state nature preserves.
- of 334 animal species listed as endangered, threatened or special concern, 96 have been protected on state nature preserves.
- of Kentucky’s 62 natural community types, 23 high quality examples have been protected on state nature preserves.

The preserves also provide opportunities for the public to enjoy our best natural lands, with an estimated **25,000 visitors** annually. The preserves are an incomparable resource for **environmental education**, from elementary school to graduate student research. Stewardship of the nature preserve system requires specialized expertise in ecosystem restoration techniques such as prescribed burning and invasive plant control. Activities range from researching the viability of a rare species population, to creating interpretive materials for the public, to building hiking trails.

Nature preserves are often thought of as natural areas, best left to the care of “Mother Nature.” Unfortunately, there are too many threats to natural areas for a hands-off approach. Unauthorized use of ATVs, timber theft, ice storms and wildfire, etc. all threaten these lands. And even more relentless is the proliferation and invasion by non-native species. Without constant vigilance, **invasive plants, animals and diseases plague the preserves**, which overwhelm the habitats and rare native species we protect.

Stewardship needs have steadily increased. All preserves require routine maintenance such as boundary posting and inspections. Habitat restoration, invasive species control, trail construction or rare species monitoring varies with each preserve. A number of preserves require intensive management with prescribed burning to restore habitat and ensure the survival of rare species.

A less visible threat to the nature preserves comes from our **growing inability to provide necessary stewardship**. It is **IMPOSSIBLE** for two staff to steward **64** state nature preserves! For over 2 1/2 years the 25 preserves in the western half of the state have received scant attention and are vulnerable to illegal activities such as poaching and ATV trespass. Invasive species control requires years of perseverance to contain or eliminate a species from a site and ongoing monitoring to prevent re-invasions. Hard work from past years is being **erased** as invasive species rebound in the absence of staff. Safety may be compromised on trails as we struggle to maintain infrastructure such as bridges, steps and railings. The Commission needs a separate infrastructure maintenance budget to provide for salaries and equipment. We have assisted the creation of a **non-profit “Friends of KSNPC”** to explore the potential for donor support to meet these needs, but results so far have been limited.

When we can find willing partners the Commission has developed agreements as a strategy to help meet the demands of preserve management. Custodial care of two preserves has been assigned to other partners. Agreements with five other public agencies and private organizations to assume partial responsibility for the costs of preserve maintenance are in effect. And we seek **volunteers** from scout troops, school groups, and members of organizations such as the Sierra Club and the Kentucky Native Plant Society.

The 64 state nature preserves are scattered across the Commonwealth from the banks of the Mississippi River to the Virginia border. Budget cuts in the current biennium have resulted in stewardship vacancies unfilled, worsening a bad situation. One regional preserve manager is stationed in a satellite office in Whitesburg in Letcher County, and the preserve branch manager

is located in Frankfort – this is the *entire* stewardship staff. Due to CAP reductions and budget cuts, we have **not been able to add new stewardship staff in over 14 years** and have **lost four positions since 2010** – yet we have **added 13,913** preserve acres!

Three new preserve managers are requested to divide the oversized eastern and western regions. One would be based in the western Kentucky Jackson Purchase area. Two additional stewardship assistants and 4 seasonal workers are needed to rotate among the preserves, conducting prescribed burns, controlling exotics, building trails, maintaining trails and bridges, posting boundaries, restoring habitat and more.

MAJOR STEWARDSHIP ACCOMPLISHMENTS: 2013-2014:

- **A New trail system** opened at the E. Lucy Braun State Park Nature Preserve (formerly Pine Mountain Trail State Park Nature Preserve). It enables hikers to enjoy the scenic beauty of the southeastern Kentucky mountains. The new trail begins at the Little Shepherd Trail on the crest of Pine Mountain in Harlan County.
- **Five prescribed burns** were conducted in 2013. None were possible in 2014 for lack of staff.
- **Invasive plant control.** Persistent efforts to control kudzu and Asian bittersweet have met with success on several preserves, but with reduced staff we are seeing an increase in other invasive species that are harder to control at other preserves.
- Worked with **KET's Kentucky Life** program to film a segment on the diversity of wetland seeps at **Frances J. Palk SNP in Pulaski County**.
- **Feral hogs** at Obion Creek SNP were successfully reduced through a joint effort with the Kentucky Department of Fish and Wildlife Resources and local government. Without vigilance, the feral hogs will repopulate.
- The Commission has led the state in fighting the **hemlock wooly adelgid** with over **31,000 trees** treated since 2008. In the last two years over **27,000 trees** were re-treated in areas critical to visitor safety and rare species protection. Hemlock die-off will alter the landscape and damage habitat for numerous plants and animals (including several rare species) dependent upon the moist, shaded habitat provided by hemlocks. The large dead trees will be a danger to trails and visitor facilities and have to be removed.

FUNDS TO PURCHASE LAND:

The Commission's only source of state funds to purchase land for nature preserves is the **Kentucky Heritage Land Conservation Fund (HLCF)**. During the biennium the Commission purchased properties totaling \$119,903. However, the available funds in September 2014 are down to \$13,518, which is insufficient for another land purchase.

The 2015/2016 Biennial Budget **transferred \$5,000,000** from the Heritage Land Conservation Fund to the General Fund. The total receipts for HLCF in the FY2014 (FY2015 is still underway) were \$4,335,251. Assuming comparable income in FY2015, this would leave the fund with a \$664,749 *loss*. The biennial budget again takes HLCF funds in FY2016, except in a smaller amount of \$3,000,000. These two reductions effectively set back the expansion of the state nature preserves system for two years. As HLCF is the **only state program funding the purchase of conservation land**, (shared by five state agencies and local governments), the General Fund transfers set the *entire* state land conservation program back two years!

One of three revenue sources earmarked for HLCF is proceeds from the sale of *Nature's Finest* auto license plates. The transfer of HLCF funds to the General Fund has led more than one nature license plate purchaser to complain they will not buy them again. The transfer of monies from HLCF is seen by the public as deceptive; a broken government promise as their \$10 donation to get the plate is not being used to purchase conservation lands as advertised.. It will certainly have a negative effect on sales of *Nature's Finest* license plates.

Considering the Commission's lack of capacity to manage existing preserves, a first reaction would surmise its better not to purchase more land. However, as the saying goes, "they are not making any more land." A growing population and other needs are still converting land at a high rate. It is better, even necessary, to acquire uncommon high quality natural areas, which are increasingly difficult to find, even if we lack stewardship capacity. We can at least protect them from development under public ownership, until we rebuild our stewardship capacity, rather than risk their permanent loss.

The Commission also holds **conservation easements** on lands that are not available for purchase and will remain in private ownership. We have protected 180 acres this way - with populations of federally endangered plants, maternity caves for endangered gray bats, and Kentucky gladeceess. The newest (2014) is Baxley Conservation Easement, located north of Frankfort with high quality populations of one of the Commonwealth's rarest plants - Braun's

rockcress.

Note: A list of your state nature preserves, by county, is included as Appendix 3. A directory of preserves with descriptions, location and directions are available on the KSNPC website at <http://naturepreserves.ky.gov>. A printed directory is available on request.

II. PROTECTING DIVERSITY: OUR BIOLOGICAL RESOURCES



The Commission's mandate is to protect the biological diversity ("biodiversity") of Kentucky. **Why is it so essential?** Biodiversity is the abundance of plants, animals and other organisms and their multitude of adaptations which enable living organisms to survive in a great variety of habitats, from sun-baked rocky glades to cool mountain ridge bogs. This diversity of life is fundamental to the ability of living organisms to evolve, adapt and survive in greatly diverse and changing conditions across the planet.

Kentucky's biological communities, from Mississippi River sloughs to lush Appalachian forests in the east, are as extraordinary as they are beautiful. Kentucky is home to **102 endemic species** of plants and animals that are found **nowhere else in the world**. The southeastern U.S. is the *global* center of diversity for salamanders, freshwater fishes, mussels and crayfish, with more species found here than anywhere else in the world. Kentucky is ranked *third* and *fourth* respectively after only Alabama and Tennessee for the number of freshwater fish and mussel species found in the U.S. The **Green River**, which flows through Mammoth Cave National Park, has been ranked **fourth nationally** for its aquatic diversity. Our forests in the east, described as "mixed mesophytic", are one of the most **diverse temperate deciduous forests in the world**, rivaling similar forests in China. **Blanton Forest State Nature Preserve**, which protects one of the **largest old growth forests east of the Mississippi River**, is an outstanding example of mixed mesophytic forest.

A NatureServe report published in 2002 ranked Kentucky 23rd in the U.S. for total species diversity. Yet we ranked **ninth** for the **most extinct** species. While Kentucky is fourth in the U.S. for freshwater mussel diversity, pollution, impoundments and the alteration of streams and rivers have decimated their numbers, leaving them one of the **most imperiled groups** in the country. One in five of Kentucky's 104 mussel species are extinct or extirpated

(no longer found in Kentucky).

Should we be concerned about the loss of species and habitats? Species diversity is our best insurance for a stable, functional, prosperous environment. Over reliance on one species has caused human tragedy. Potato blight caused the Great Irish Famine in the 1840's and over one million deaths. Wild species provide a genetic storehouse that can be used to improve domesticated species. The Southern Corn Blight of the 1970's was countered using blight resistant genes found in wild ancestors of domesticated corn. The more plant and animal species we have to rely upon, the greater our resources and options for food, medicines and the myriad other products they contribute to our lives.

Key reasons to protect Kentucky's biodiversity:

1. **Pollinators**— *“Pollinators contribute substantially to the economy of the United States and are vital to keeping fruits, nuts, and vegetables in our diets. Over the past few decades, there has been a significant loss of pollinators—including honey bees, native bees, birds, bats, and butterflies—from the environment. The problem is serious and poses a significant challenge that needs to be addressed to ensure the sustainability of our food production systems, avoid additional economic impacts on the agricultural sector, and protect the health of the environment.”* Fact sheet, U.S. White House, June 20, 2014. The Commission is making pollinator conservation a priority program.



This Broad-winged Skipper nectaring on a white morning-glory is rare in Kentucky and tracked as a threatened species.

2. **Medicines** – **Forty percent of all medical prescriptions** dispensed in the United States are derived from plants, animals and microorganisms, or are synthesized versions of their compounds.

3. **Wildlife-related Recreation**– Kentucky’s natural beauty draws **millions of visitors** each year to our state parks, nature preserves and similar lands. The KY Department of Fish and Wildlife Resources reports an estimated **\$5.94 billion** total economic impact annually from hunting, fishing, wildlife watching and boating in Kentucky.
4. **Kentucky Forests - Economic Impacts** – The University of Kentucky’s Department of Forestry projects an estimated **\$8.3 billion** direct impact on Kentucky's economy by the forest and wood industry for 2014.
5. **Eco-Services** – Forests provide oxygen to the atmosphere, cool local climates, and filter surface waters. Louisville, which is suffering heat island effects, is engaged in a campaign to restore its urban tree canopy. Surface water runoff from uplands is filtered as it flows through wetlands. Sometimes referred to as “nature’s kidneys” wetlands release clean water to streams and rivers, providing our drinking water.

CAUSES OF BIODIVERSITY LOSS:

➤ **LAND CONVERSION** – The single biggest impact on Kentucky’s biodiversity (and nationally) is land development – i.e. habitat loss. High quality natural areas support a great diversity of species, unlike our managed landscapes which we populate with a relatively few preferred species. Suburban lawns are planted in fescue and a relatively few ornamental plant and tree species that thrive in urban areas. Farmlands are typically fescue pastures or monoculture row crops. Our managed landscapes are desirable and necessary, but an unintended consequence is a loss of natural habitat and the many diverse species they support. As the conversion of land continues, it becomes more critical to protect the best remaining natural areas that serve as reservoirs for Kentucky’s biodiversity. If we do not protect key areas they will continue to shrink to such a small scale that they will not be able to sustain their diversity over time. Consider a small city park. It may support squirrels, pigeons and raccoons, but not bobcats, foxes, bob-white quail or lady’s-slipper orchids.

USDA data reveals the long running loss of rural and natural lands. The Natural Resources Inventory for Kentucky, 1982-1997 states, “In Kentucky, **urbanization has caused a large land use change**. In 1982, there were 1.15 million acres of urban areas and roads. In 1997, this increased to 1.74 million acres... a 52 percent growth in urban and road areas over the 15-year period.”

The Natural Resources Inventory is conducted every 5 years. The 1992-97 report reveals that Kentucky experienced a total Rural Land Loss (farms and forests) at a rate of **130 acres per day**. The rate slowed in 2007-2010 to 41 acres per day (presumably due to the economic downturn). The 2012 figures are not yet available. Though the rate of loss fluctuates, the lands converted to urban/developed uses remain so. The data clearly demonstrate a widely recognized trend of non-stop land conversion – and the loss of natural lands. Even once common species like the **bob-white quail** are becoming scarce because of habitat loss. Over 67 percent of Kentucky’s quail population has been lost since 1960.

When compared to the seven surrounding states, **Kentucky has protected the smallest percentage of its land**. To be competitive with other states and to help attract economic development, Kentucky needs an expanded land conservation program as such lands contribute to higher rankings in **quality of life** assessments.

➤ **INVASIVE SPECIES** – The second greatest threat to native species diversity is from the invasion of exotic (non-native) species. Invasive species like **kudzu (pictured right)**, Canada thistle, Johnson grass, bush honeysuckle and others multiply rapidly, choking out native species, often the rarest ones.

The U.S. Government Accounting Office has long recognized the enormous costs in **billions of dollars in damage** to agriculture,



Kerry Britton, USDA Forest Service, Bugwood.org

natural areas, businesses and consumers caused by invasive species. Kentucky farmers spend money and labor on herbicides and fuel to fight thistles and Johnson grass, which are also a scourge for natural areas. Kudzu is the poster child of invasive plants, but other less well-known species like bush honeysuckle and garlic mustard are rapidly overwhelming the understory of forests in the Bluegrass area. Unfortunately, new invasive species are continuing to arrive in the United States, due to our global economy.

One of the most recent and devastating invaders is the **Emerald Ash Borer (EAB)**, a tree boring insect from Asia. Clusters of dead ash trees are already visible along Interstate 64 from Jefferson to Woodford counties and north to Covington along Interstates 75 and 71. EAB infestations are found in 31 counties and spreading. Ash die off will have a substantial economic cost as homeowners have to remove dead trees to protect their property. Government agencies will incur similar unplanned costs with public buildings and roadways. The economic impact to the forest products industry from the loss of ash lumber is estimated in the hundreds of thousands of dollars.

White Nose Syndrome (WNS) is a fungal disease from Europe which has been decimating U.S. bat populations, killing up to 95 percent in some areas. Bats are the major predator of night flying insects. Severe losses in bats are expected to have costly impacts on agricultural production, forest health and even lead to increased disease in both wildlife and humans via mosquitoes. WNS was first identified in New York in 2006 and in only eight years has spread to Canada and at least 20 states, including Kentucky.



Little brown bat with white nose syndrome.
Photo courtesy Ryan von Linden/New York Department of Environmental
Conservation and USFWS

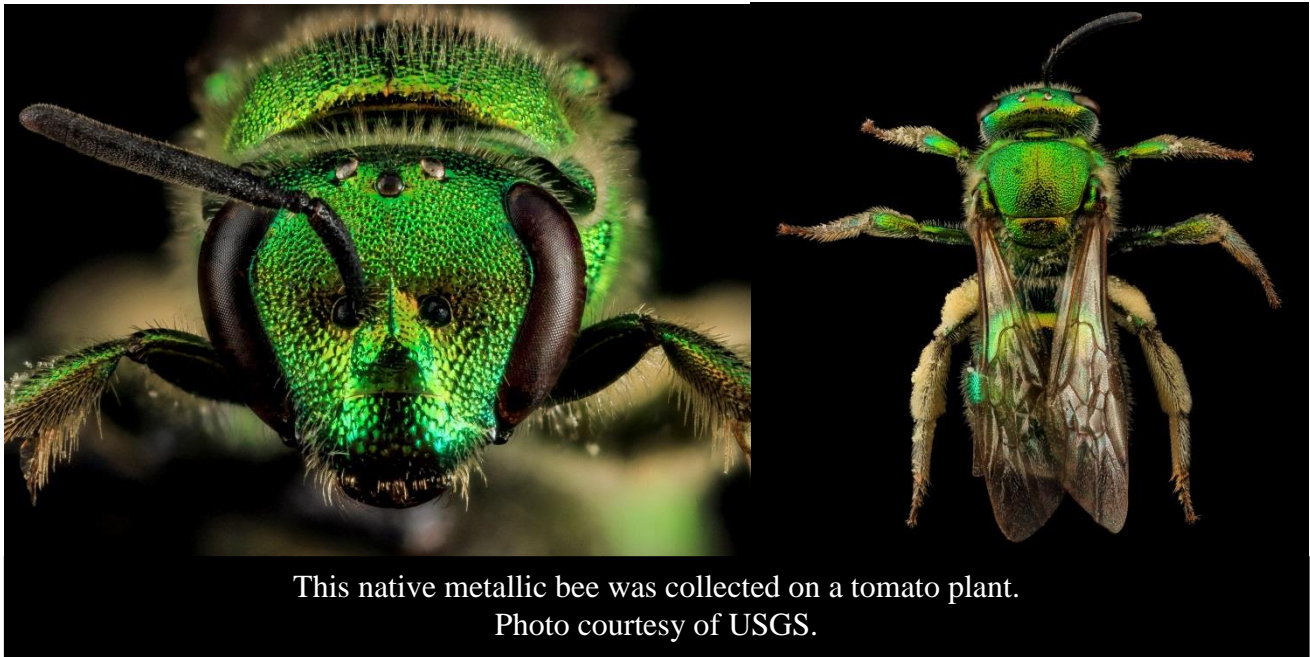
The hemlock wooly adelgid (HWA) is an insect pest that has decimated hemlock coves in the Great Smoky Mountains. First found in Harlan County in 2006, it has infested all eight state nature preserves on Pine Mountain, including **Blanton Forest**, the state's largest old growth forest. Dead hemlocks now mar the famous view from the dining room of Pine Mountain State Resort Park. Huge dead hemlocks along trails at the park will have to be taken down at no small cost, or trails closed for visitor safety. To fight this pest, the Kentucky Division of Forestry organized an HWA strike force with the state's land-owning agencies using the Heritage Land Conservation Fund. This initiative enables the Commission and other state agencies to more efficiently treat priority areas. In the past two years, the Commission's stewardship staff and contractors have treated over 27,354 hemlock trees along trails and in areas critical to the protection of rare species dependent upon hemlocks.

Eradicating invasive species once they have gained a foothold is at the very least costly and often impossible. The take home lesson is that we need increased vigilance against their initial introduction – and quick response strike teams when they first appear.



Evidence of hemlock wooly-adelgid on eastern hemlock tree.
Photo courtesy of Connecticut Agricultural Experiment Station Archive and
Station/Bugwood.org

➤ **POLLINATOR DECLINE**- The decline in pollinators is not only a threat to biodiversity and plants dependent on being pollinated by other species, but to **food crops** as well. Pollinating insects provide an extremely valuable ecological service that contributes billions to our worldwide economy. Approximately 75 - 85 percent of flowering plants require an animal, mostly insects, to move pollen. Butterflies, moths, flies, beetles, wasps, etc., all play important roles in pollination. Bees, however, are among the most important pollinators. The USDA estimates that bees pollinate 75 percent of all nuts, fruits and vegetables grown in the U.S., a harvest worth about \$20 – \$30 billion annually. Several studies have documented that more and better pollination occurs when there are multiple pollinator species in close proximity to the crops, resulting in an increase in yields and profits for farmers.



Honey bees (introduced from Europe) have long been promoted as good pollinators, but approximately 4,000 native bee species found in North America are increasingly being recognized for their pollination services. In many cases native bees are even more effective pollinators than honey bees. For example bumble bees can buzz pollinate (especially important for tomatoes and other vegetable plants), something honey bees cannot do.

It is now widely known that both native bees and honey bees are declining worldwide. Loss of habitat, parasites and diseases, and increased pesticide use, especially neonicotinoid pesticides, have all been linked to the declines. A phenomenon known as Colony Collapse Disorder (CCD) has been killing honey bees.

Bumble bee declines are being documented and four North American bumble bee species, Franklin's, yellowbanded, western, and rusty-patched have declined significantly since the 1990s. The rusty-patched occurred in Kentucky, but has not been observed in decades.

What can be done to ensure our native insect pollinators maintain the healthy populations necessary to add billions of dollars annually to the agricultural economy? Two changes would make a huge difference.

First, increase the number of natural areas and their proximity to agricultural fields. Natural areas with rich native plant diversity in close proximity to agricultural fields will increase crop yields and profits because there will be a rich diversity of insect pollinators in these habitats. Even small patches of native flowers on the perimeter of large farms can increase crop production if combined with the preservation of larger tracts of natural habitat.

State nature preserves are high quality natural areas with habitat for pollinators to contribute to crop yields at nearby farms. At Thompson Creek Glades State Nature Preserve, a 169-acre preserve in Larue County, we have documented over 600 species of butterflies and moths - approximately 25 percent of the butterfly and moth species known from Kentucky! The bee fauna of Thompson Creek has not been catalogued, but there is every reason to believe it mirrors the high diversity of butterflies and moths, which are also pollinators. Nature preserves and other natural areas are extremely important sources for pollinators all across Kentucky.

Second, eliminate when possible, or at least reduce the use of pesticides, especially neonicotinoids. Systemic pesticides, like neonicotinoids, are transported through the plant contaminating the pollen and nectar consumed by bees and other pollinators. The half-lives of neonicotinoids in soils can exceed three years, making them deadly for years. Pesticide-free zones are critically important to the survival of our native bees and other pollinators and ensuring high agricultural yields.

➤ **FRESHWATER MUSSEL DECLINE** - The Commission, working with other agencies, has documented significant losses in freshwater mussels in Kentucky. This has been observed in Marsh Creek (McCreary County), Horse Lick Creek (Jackson County), Little South Fork Cumberland River (Wayne County) and Buck Creek (Pulaski County).

All four of these streams were considered major refuges for healthy populations of multiple species, several federally listed. The two most recent collapses were in the Marsh Creek system in 2012 and the Little South Fork in 2013. The Marsh Creek study found **only**

four live specimens. The Little South Fork study documented a decline from **24 species to only five.**

A multi-agency effort (USFWS, USFS, KDOW, KDFWR, KSNPC) was coordinated to determine the cause of the collapse of the Marsh Creek mussel fauna and if current stream conditions would support reintroduction of mussels. Results from water and sediment samples indicate that runoff from contemporary and historical fossil fuel extraction in the watershed are numerous and chronic. Survival rate of propagated mussels placed in the stream is extremely low. Further investigation into the effects of the land use practices, especially, fossil fuel extraction and exploration, and the location of specific points of pollution is ongoing.

➤ **CLIMATE CHANGE**

“Climate change, once considered an issue for a distant future, has moved firmly into the present.... Americans are noticing changes all around them. Summers are longer and hotter, and extended periods of unusual heat last longer than any living American has ever experienced. Winters are generally shorter and warmer. Rain comes in heavier downpours. People are seeing changes in the length and severity of seasonal allergies, the plant varieties that thrive in their gardens, and the kinds of birds they see in any particular month in their neighborhoods.” From: The National Climate Assessment, Overview, an 800 page report, mandated by Congress and released May 2014. The National Oceanic and Atmospheric Administration (NOAA) just reported that 2014 was the warmest year recorded since recordkeeping began in 1880; and that “Nineteen of the twenty warmest years on record have occurred in the past 20 years.”

Surprisingly, NOAA reports that statewide average temperatures for Kentucky, Jan.-Dec., 2014 were below average, along with much of the U.S. southeast and midwest. Climate change induces much variability on a global scale.

The USFWS has declared that climate change, “Is the **single greatest conservation challenge of the 21st century...**”. “Accelerating climate change will exacerbate all of these resource threats (i.e. habitat fragmentation, pollution, invasive species, disease, and threats to water quality) affecting our nation’s fish, wildlife, and plant resources in profound ways. While many species will continue to thrive, some populations may decline, many will shift their ranges substantially and still others will face increased risk of becoming extinct. Others will survive in the wild only through direct and continuous intervention by wildlife and fisheries managers.” U.S. Fish and Wildlife Service website, Dec. 11, 2012.

Climate change will unquestionably be a tremendous challenge to Kentucky's biodiversity. The only uncertainty is how severe it will be. Localized effects are very difficult to predict, especially with the extreme weather events. But one thing is clear – we will have to work on a **landscape level**. This means protecting larger areas and establishing corridors to connect areas of high biodiversity to facilitate the migration of animals and plants as they are thrust into an unprecedented period of rapid ecological change.

III. THE NATURAL HERITAGE PROGRAM:

SCIENCE BASED CONSERVATION – The Commission has created the **most complete and accurate database** of information on rare species, natural communities and conservation lands in Kentucky. Known as the Natural Heritage Program, it is built on 38 years of field research by Commission biologists, and compilation of herbarium and natural history museum records and field records from other agencies and citizen biologists. This biological “heritage” data is not only used in Kentucky, but it is compiled as part of an **international data network** extending from **Canada to Latin America**. Coordinated under the auspices of NatureServe (a non-profit) the Commission's scientists are part of a network of over 80 independent organizations, with **nearly 1,000 dedicated scientists**. These experts identify which species and natural communities are rare, and provide guidance for their conservation. For example, Kentucky has multiple species of songbirds which raise their young in Kentucky, and migrate to South America to overwinter (i.e. purple martins, various warblers). The heritage data we provide helps identify important biological areas to inform decisions about land use across the continents.

The Commission's staff of expert biologists includes:

- **One botanist** specializing in rare plants.
- **An aquatic zoologist** specializing in fish, crayfish and freshwater clams.
- **An invertebrate zoologist** for multiple groups including pollinators, aquatic species and cave species, many of which are found only in Kentucky.
- **Two ecologists** for plant communities; i.e. forests, wetlands, prairie remnants, barrens, glades, bogs, etc.

The Commission lacks a key expert - a terrestrial zoologist to survey **birds, mammals, reptiles and amphibians**. The last terrestrial zoologist was lost through retirement and attrition

in 2008. This is a **critical** expertise. Animal groups are the most widely appreciated wildlife and many are vital to the ecosystems they inhabit. Without the zoologist position we lack the ability to work for the recovery of Kentucky's rarest animal species. It is also needed to secure biological inventory contracts which help fund the Commission. We are seeking to partially restore the position in 2015, by "robbing Peter to pay Paul," converting a retired botany position and adding stewardship duties to help address the other critical shortage. It may not be possible to find these two skill sets in one person, but difficult times.....

NATURAL HERITAGE PROGRAM ACCOMPLISHMENTS: 2013-2014:

Pollinators and Invertebrates -

- Pollinators: KSNPC is expanding its focus on pollinators. A biologist attended the bee course of the American Museum of Natural History to learn to identify, curate, and conserve native bees. Kentucky's native bee fauna is poorly known. It is extremely important to learn more about and conserve our bee fauna since bees are vital to the pollination of crops humans depend on for food. We believe our biologist is the only person in the state to have attended this training.
- American Burying Beetle: Completed a \$15,000 grant from the United States Fish and Wildlife Service (USFWS) to conduct a feasibility study for reintroduction of an experimental population of the largest carrion beetle in North America. It was last confirmed in the state in 1974 and is federally listed endangered.
- Rattlesnake-master borer moth: Began a \$20,000 USFWS grant to conduct surveys of this prairie-dependent moth. It has declined range-wide with the loss of prairie habitat and is believed to occur at only 16 sites globally, and may become federally listed.

Botany –

KSNPC has the **only botanical conservation program in state government**. It is a clearinghouse for native plant information with a special focus on plants that are declining. We conduct floristic surveys for various state, city, and local organizations and receive federal funds to work with plants federally listed under the Endangered Species Act (Section 6 program).

- **White-haired goldenrod**, an endemic plant (found only in Kentucky's Red River Gorge) will be **removed from the federal list** as a result of our surveys over the years. Intensive survey work in the gorge discovered more populations.
- Provided data to the USFWS to assess two species that were federally listed; Kentucky glade cress (known only from Jefferson and Bullitt counties) and globe bladderpod, found on rocky woodland slopes in the Bluegrass.
- Conducted floristic inventories on 9,563 acres.
- Coordinated the inaugural **Kentucky Botanical Symposium** with the Kentucky Native Plant Society. This event brought together close to 100 academics, professionals, land managers, and citizen scientists.
- KSNPC botanists discovered one of two populations of a species "**new to science**" that was described in 2013, the **Kentucky clover**.
- Discovered two plants, previously unknown from Kentucky, increasing the known botanical diversity of our state.
- Launched the **Rare Care Volunteer** program to aid in protecting rare plant populations.
- Published the Kentucky Rare Plant Report in 2014
- The senior botanist retired in 2014. We have but a single botanist left, which is woefully inadequate for state government's only botanical program.

Ecology –

- Completed a grant survey of **Mammoth Cave National Park** for rare wetland communities (marshes, flatwoods, etc.) and rare species.
- Conducted plant community surveys and mapped more than 9,500 acres.
- Completed a three year project to locate surviving rare grasslands and dry woodlands of west-central Kentucky (which provide habitat for declining grassland fauna, such as bobwhite quail). The ecologists are working with other agencies to protect the most significant sites.
- Conducted searches for high quality natural areas in Caldwell, Crittenden, Lincoln, Hopkins, and McCreary counties.
- Discovered several new locations for natural communities including a complex of rare wet meadow remnants in Lincoln County.

Aquatics –

- Upper Kentucky River surveys delineated the distribution of four rare fish: the federally listed blackside dace, the Cumberland darter, the Cumberland arrow darter, and the Kentucky arrow darter. New locations of each species were found.
- Completed mussel surveys of the Upper Cumberland River, with a focus on Cumberland papershell populations. Approximately 125 surveys were conducted from 2011-2014. Six of 15 historical populations were confirmed and one new population discovered in Whitley County. Only seven populations remain of this imperiled mussel in Kentucky, and only three appear stable and secure.
- Surveyed fish and mussels at the **Green River Bioreserve**, Western Kentucky University. Over **30 species of mussels** and **55 species of fish** were encountered. The **bottlebrush crayfish**, a Green River **endemic** (found nowhere else), was abundant. The Green River continues to maintain its national ranking.
- South Fork Kentucky River near Booneville was surveyed and a diverse and abundant mussel bed was encountered with several species of interest -- the snuffbox, longsolid, and round hickorynut.
- Rediscovered the first occurrence in over 20 years of the federally endangered Cumberland darter in Laurel Fork in Archer-Benge State Nature Preserve in Whitley County.

A. USING NATURAL HERITAGE DATA

The Commission provides natural heritage data to state, local and federal agencies and conservation organizations through data agreements. It is an invaluable resource, meeting government and the private sector needs for current, reliable data for environmental impact statements, biological analyses, research, and long-term conservation planning. We responded to **214 data requests** during fiscal years 2013 and 2014.

Kentucky's natural heritage database contains an impressive **12,867 records** of species and ecological communities, 792 high quality site records, including caves, and 601 conservation lands records. Being a member of NatureServe and using **BIOTICS** allows our data to be compared with data from other states and countries throughout North and South America. This enables NatureServe to rank species and natural communities on a **global** level. Conversely, the Commission is responsible for **state** level ranking of endemic species found only in Kentucky.

This natural heritage data is employed for numerous purposes, including review of development projects (Energy and Environment Cabinet and Transportation Cabinet); Outstanding State Resource Water designations (Division of Water); Species of Greatest Conservation Need (Kentucky Department of Fish and Wildlife Resources); species status reviews for federal listing (U.S. Fish and Wildlife Service), and forest species conservation (Division of Forestry and U.S. Forest Service).

B. CONSERVATION PLANNING –

Natural heritage data has been used in conservation planning with a variety of organizations such as Kentucky Natural Lands Trust on projects including the **Pine Mountain Wildlife Corridor** and the **Fort Knox-Bernheim Wildlife Corridor**.

The Commission is developing an agreement with the USDA Natural Resources Conservation Service to use heritage data to inform their staff and farmers/producers of the potential presence of rare species and communities when NRCS cost-share grants are approved. The agreement will enable specific projects to be better evaluated and useful guidance provided for producers to avoid harmful practices, and improve wildlife habitat when possible. Kentucky's NRCS office expects the program to become a national model.

The use of **Geographic Information Systems (GIS)** enables us to provide data and comments in many user-friendly formats. The development of new services such as delivering real-time data to other agencies, providing **searchable data to the public via the Web**, and creating visual display products has made the natural heritage data more accessible and useful in conservation planning by partner agencies.

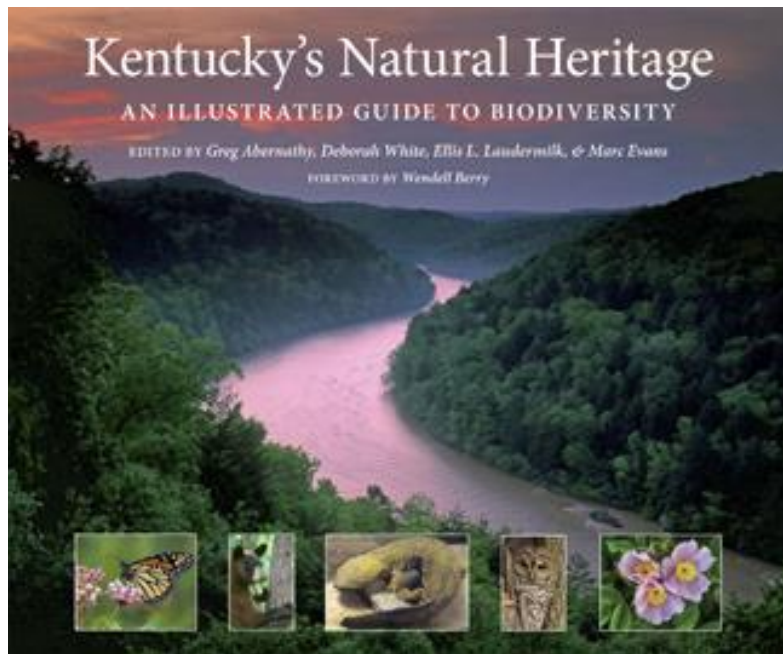
The Commission continues to enhance custom GIS applications created for the Department for Natural Resources, for surface coal mine permit reviews and for the Division of Abandoned Mine Lands for reclamation project reviews. The applications we created provide a suite of tools to streamline the review process, saving staff time and providing permit reviewers with new tools and enabling them to access the latest imagery and spatial data available.

The Commission is the designated Kentucky partner for the **USGS Protected Areas Database**. We compiled records from land trusts, private organizations and state and local agencies, identifying parcels and land protection level to the USGS standard for all individual tracts under conservation management. This dataset will be combined with data from the rest of the U.S. and widely shared to facilitate **conservation planning at local and national levels**.

The Commission via a FHWA grant, provided heritage data to the Ohio/Kentucky/Indiana Regional Council of Governments for transportation planning. This data will help avoid conflicts between transportation infrastructure and high quality natural areas.

IV. ADDITIONAL COMMISSION PROJECTS:

A. Education/Outreach:



The Commission's highly acclaimed book, *Kentucky's Natural Heritage, An Illustrated Guide to Biodiversity* expounds on Kentucky's rarest species of plants and animals, some of which are found nowhere else in the world. The book was written to educate Kentuckians about the Commonwealth's biological wealth, and inspire support for conservation. A primary goal was for it to become a classroom **resource book for teachers**. That goal is being achieved in partnership with a generous private donor and **Kentucky Educational Television (KET)**.

A **private donation** of over **\$23,000** is funding a reprint of *Kentucky's Natural Heritage*. 700 copies will be provided to **all Kentucky middle and high schools, colleges and universities**.

A **new e-book** with concepts and graphics from "*Kentucky's Natural Heritage*" has been released in partnership with KET. *Kentucky Bio: Natural Diversity in the Commonwealth*, introduces students to the natural world around them. The website <http://tdcms.ket.org/kybio/kentuckybio.html> is currently live.

“*Kentucky’s Natural Heritage*” has also been used to develop interactive videos for **PBS LearningMedia**, a free on-line resource for all Kentucky public and private school teachers, students and homeschoolers. KET developed units for this web site in collaboration with KSNPC. <http://ket.pbslearningmedia.org/collection/kentuckys-natural-heritage-an-interactive-guide-to-biodiversity/>.

B. GENERATING AGENCY RECEIPTS –

KSNPC undertakes grants and contract work to generate **agency receipts** to balance the Commission’s budget. But while contract work benefits the budget, it impedes our biologists in their most important work with rare species conservation. The following table lists major projects undertaken by the Commission for FY 2013-14.

	FY13	FY14
U.S. Fish and Wildlife, Endangered Species Act (Federally listed plants)	\$ 37,422	\$ 38,404
Ky. Dept. for Natural Resources (data for surface mine permit review)	\$ 33,000	\$ 33,000
Division of Abandoned Mine Lands (data for project review)	\$ 5,000	\$ 5,000
Ky. Dept. for Natural Resources (Nat. Areas Inventory and Aquatics)	\$ 27,000	\$ 27,000
U.S. EPA/ KY Div. of Water/ Univ. of Louisville	\$31,900	\$98,100
Div of Water HLCF surveys/ Wilson Tract, Little S Fork, Davis Bend	\$	\$ 25,000
Div of Forestry HLCF surveys/ Green River, Tygarts	\$ 4,000	\$ 2,700
Dept of Parks surveys/Blue Licks,Pine Mtn,	\$ 40,000	\$ 49,100
American Burying Beetle Reintro. USFWS	\$ 5,000	\$ 10,000
Mapping Services for USFWS	\$ 3,250	\$ 12,000
Fish and Mussel Surveys for USFWS	\$ 25,000	\$ 32,000
HLCF-County inventories Hart,Shelby,Pulaski,Kenton,Livingston,Estill,	\$ 24,500	\$ 31,300
Ohio/KY/Indiana - Fed Hwy Admin Grant		\$ 1,925
NatureServe, Heritage Data for regional/national projects	\$ 8,000	\$ 5,000
Daniel Boone Nat’l Forest	\$ 21,000	
Grants/Contracts receipts total	\$265,072	\$370,529

C. KENTUCKY PRESCRIBED FIRE COUNCIL –

The Commission works with other state and private organizations to address the growing need to use prescribed fire to restore those natural community types that evolved with fire as a natural element, i.e. prairie remnants and barrens. The Prescribed Fire Council has developed training standards, is coordinating research and creating educational materials on **the safe use of prescribed fire**. KSNPC's branch manager led the organization as chair during the biennium.

D. SOUTHEAST REGION REPRESENTATIVE U.S. COUNCIL –

The Commission's director served until December 2014 as a southeast representative on the U.S. Council of NatureServe. The director and data manager are on a task force to find solutions to data backlogs across the U.S. and Canada.

E. CONSERVE KENTUCKY –

The General Assembly's Land and Stewardship Conservation Task Force issued recommendations in 2009 for **expanded land conservation** across Kentucky. Since the task force ended, several participants have continued working in a broad based coalition, *Conserve KY*. With funding from The Nature Conservancy and the Trust for Public Land a **public opinion poll** was conducted revealing strong support across all demographics for increased conservation of land and water resources. December 2013 poll results show that by a four-to-one margin, voters want conservation funding increased (38%) as opposed to reduced (9%). **Tax credits** for conservation received strong overall support of **79 percent of voters**.

The *Conserve KY* coalition successfully saw passage of HB 281 in 2013, allowing non-profit land trusts to apply to the Heritage Land Conservation Fund for state land acquisition grants with a dollar for dollar match. This matches government funds with private funds. In the 2014 session *Conserve KY* put forth HB 376 to create a **tax credit for donated conservation land or easements**, which **passed the House unanimously**.

We are losing ground to nearby states like Virginia, Tennessee and North Carolina which devote far more state funds to conservation. *Conserve KY* is exploring ideas to find a new funding mechanism for more land conservation.

F. REGISTERED NATURAL AREAS –

The Kentucky Natural Areas Registry enrolls high quality natural areas owned by private individuals or organizations to encourage them to steward significant natural sites. The registry recognizes landowners who partner to protect ecologically significant property. With 93 percent of the state in private ownership this is crucial. The registry is educational for many private landowners, who may not be aware of special qualities of land they own. As such, the use of registries can help prevent the inadvertent destruction of important sites.

A total of 59 landowners are enrolled in the Registry program, encompassing 8,211.5 acres, providing voluntary protection for 46 state-listed species and 21 of our natural community types.

V. RECOMMENDATIONS:

A great deal has been accomplished by the Commission in 38 years, but much remains to be done. 27,663 acres have been forever protected as preserves, but considering that **Kentucky has over 25 million acres**, we need a greatly expanded nature preserve system to protect at least one viable example of Kentucky's many unique natural communities. And we ***must restore critical stewardship*** and **natural heritage** positions. The loss of 9 staff since the start of major budget cuts in 2008 has made it impossible to fulfill our statutory missions.

KRS 146.485(13) directs the Commission to report to the Governor and General Assembly on matters which may significantly affect the natural ecology or the human environment, and to recommend actions to prevent significant adverse effects which would harm **our quality of life**. To this end, the Commission recommends:

1. Restore stewardship staff to protect and manage state nature preserves and increase public access.

The Commission has **only two staff to manage 64 state nature preserves**, containing 27,663 acres. It is an **IMPOSSIBLE** task! Years of invested staff time and resources are being bled away as invasive species re-invade areas once cleared and rare habitats and communities are degraded and will eventually be lost. With only two stewardship staff, we are **unable to care for the state's nature preserves and are failing to meet this statutory duty**. Stewardship positions **must** be restored.

2. Restore critical biologist positions.

The Commission has lacked a terrestrial zoologist to survey **birds, mammals, reptiles and amphibians** since 2008. This loss impacts our ability to conduct basic biological surveys and adversely impacts other agencies, which rely on the Commission for biological data. It reduces our ability to **generate agency receipts** through biological inventory contracts. We need to restore this core biologist position.

We also lost our senior botanist to retirement/attrition in 2014. We retain one botanist, but this is inadequate for state government's only botanical program. We are the "official cooperator" with the U.S. Fish and Wildlife Service – we are the state agency responsible for the recovery and delisting of federally listed plants in Kentucky. This alone is a full time program, leaving little time to work for recovery of equally rare state listed plants which are often pending federal listing. Advance recovery work can **prevent federal listings** and their consequences.

3. Increase significantly the rate of land conservation in Kentucky.

Kentucky has fewer state-owned conservation lands than any of the seven surrounding states. Conservation lands are key to protecting biodiversity and providing eco-services, i.e. **clean drinking water, pollinating crops**, reducing summer heat, etc., which are necessary to the **quality of life** for our citizenry. Land is being developed at a rapid rate, and conservation opportunities are being lost, never to be regained in our lifetimes. Foremost, the budget must not be used to repeat a transfer of **Heritage Land Conservation Funds** to the General Fund in 2016.

4. Develop a climate change action plan.

A plan must be developed to **prepare for climate change** and its impacts on the biota and habitats of Kentucky. Because these changes will affect all of us, the plan must be developed cooperatively with KDFWR, USFWS, the Department of Natural Resources, The Nature Conservancy, and other resource and conservation agencies and groups. **A state-wide plan** is needed to identify and conserve key areas of the landscape to interconnect migratory corridors and facilitate wildlife travel. A climate action plan provided to agencies involved with land development will enable better informed land use decisions, protecting key conservation lands and ensuring continued provision of ecosystem services. The Commission has convened a steering committee and a plan is being developed.

Appendix 1. Plants and Animals Presumed Extinct or Extirpated from Kentucky

Only species that were previously known from Kentucky appear on these lists. They are considered **Extinct** if they no longer exist anywhere in the world, and **Extirpated** if they no longer are found in the wild in Kentucky, but are still in existence elsewhere.

Extinct Species

Bird (2)

- Carolilna Parakeet
- Passenger Pigeon

Freshwater Mussel (13)

- Sugarspoon
- Angled Riffleshell
- Cincinnati Riffleshell
- Leafshell
- Yellow Blossom
- Acornshell
- Forkshell
- Round Combsell
- Tennessee Riffleshell
- Wabash Riffleshell
- Cumberland Leafshell
- Tubercled Blossom
- Rough Rockshell

Vascular Plant

- Stipuled Scurf-pea

Insect

- Robust Pentagenian Burrowing Mayfly

Fish

- Harelip Sucker

Extirpated Species

Bird (3)

- Ivory-billed Woodpecker
- Red-cockaded Woodpecker
- Greater Prairie-chicken

Mammal (4)

- American Bison
- Gray Wolf
- Red Wolf
- Eastern Cougar

Vascular Plant (22)

- Canada Anemone
- Powdery Cloakfern
- Clustered Poppy-mallow
- Marsh Marigold
- Inflated Sedge
- Long-bract Green Orchis
- Showy Lady's-slipper
- Southern Shield Wood Fern
- American Water-pennywort
- Coarse Sumpweed
- Fraser's Loosestrife

- Trailing Loosestrife
- Spotted Bee-balm
- Swamp Lousewort
- Slender Dragon-head
- Heart-leaved Plantain
- Prairie Parsley
- Barbed Rattlesnake-root
- American Wintergreen
- Swamp Saxifrage
- Small-fruit Bulrush
- Eastern Turkeybeard

Freshwater Mussel (7)

- White Catspaw
- Cracking Pearlymussel
- Scaleshell
- Slabside Pearlymussel
- White Wartyback
- Winged Mapleleaf
- Rayed Bean

Fish (7)

- Scaly Sand Darter
- Diamond Darter
- Gravel Chub
- Least Darter
- Southern Brook Lamprey
- Greater Redhorse
- Blotchside Logperch

Snail (10)

- A Terrestrial Snail (*Catinella gelida*)
- Mellow Column
- Lowland Pillsnail
- Great Lakes Snaggletooth
- Temperate Coil
- A Terrestrial Snail (*Succinea bakeri*)
- Multirib Vallonia
- Trumpet Vallonia
- Hubricht's Vertigo
- Cross Vertigo

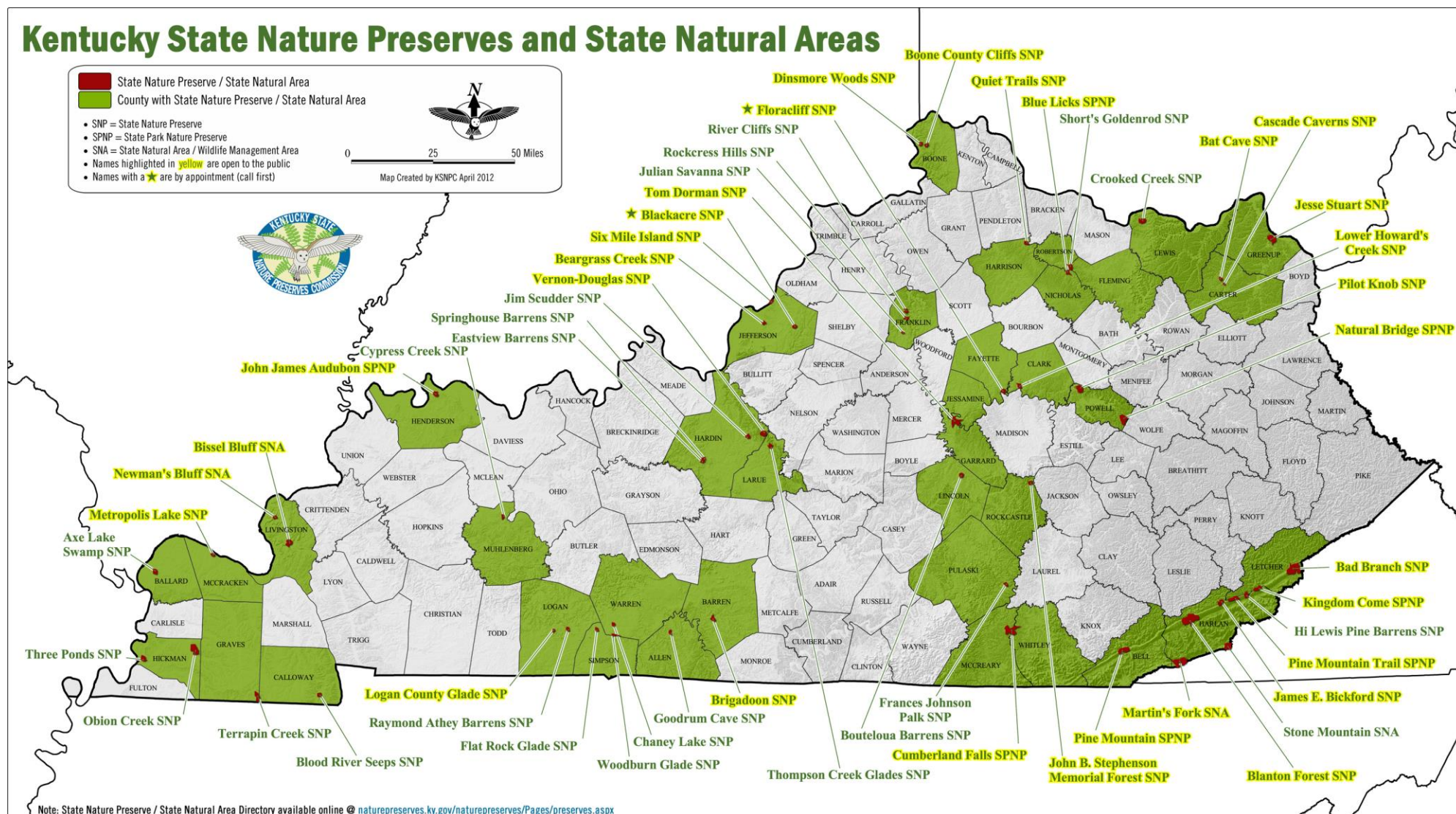
Insect

- American Burying Beetle

Reptile

- Coachwhip (snake)

Appendix 2. Kentucky State Nature Preserves & Natural Areas Map



Appendix 3. List of Dedicated State Nature Preserves

COUNTY	STATE NATURE PRESERVE	FEATURES	ACRES
Allen	Carpenter Cave CE*	Federally listed bat site	14
	Goodrum Cave SNP	Federally listed bat site	51
Ballard	Axe Lake Swamp SNP	Wetland	458
Barren	Brigadoon SNP	Mature forest	184
	Mutters Cave SNP	Federally listed bat site	108
Bell	Pine Mountain SPNP	Forest	868
Boone	Boone County Cliffs SNP	Glacial feature	75
	Dinsmore Woods SNP	Mature forest	107
Bullitt	Apple Valley Glades SNP	Federal candidate plant	60
Calloway	Blood River Seeps SNP	Unique wetland	193
Carter	Bat Cave SNP	Federally listed bat site	128
	Cascade Caverns SNP	Rare plants	18
Christian	Bob Overton Cave CE	Federally listed bat site	55
Clark	Lower Howard's Creek SNP	Federally listed plant site	228
Fayette	Floracliff SNP	Geologic feature	287
Fleming	Short's Goldenrod SNP	Federally listed plant site	210
Franklin	Baxley CE	Federally listed plant site	64
	Feindel CE	Federally listed plant site	15
	Julian Savanna SNP	Unique woodland	42
	River Cliffs SNP	Federally listed plant site	210
	Rockcress Hills SNP	Federally listed plant site	65
Garrard	Tom Dorman SNP	KY River Palisades	764
Graves	Terrapin Creek SNP	Unique wetland	268
Grayson	Lone Oak Barrens SNP	Glade/barrens	33.5
Greenup	Jesse Stuart SNP	Forest	714
Hardin	Eastview Barrens SNP	Rare plant site	119
	Jim Scudder SNP	Rare plant site	231
	Springhouse Barrens SNP	Rare plant site	54
	Vernon-Douglas SNP	Mature forest	730
Harlan	Blanton Forest SNP	Old growth forest	3124
	Hi Lewis SNP	Pine woodland	303
	James E. Bickford SNP	Forest	348
	Martin's Fork SNA	Wild River corridor	1601
	Pine Mountain Trail SPNP	Rare plant site	609
	Stone Mountain SNA	Rare plant site	1025
Harrison	Quiet Trails SNP	Forest	165
Henderson	John James Audubon SPNP	Forest	339
Hickman	Obion Creek SNP	Wetland	1601
	Three Ponds SNP	Wetland	528
Jefferson	Beargrass Creek SNP	Environmental education site	41
	Blackacre SNP	Environmental education site	175
	Six Mile Island SNP	Riverine island	81

Jessamine	Tom Dorman SNP	KY River Palisades	143
Larue	Thompson Creek Glades SNP	Rare plant site	169
Letcher	Bad Branch SNP	Rare plant/animal site	2639
Letcher	Kingdom Come SPNP	Federally listed bat site	225
Lewis	Crooked Creek SNP	Rare plant site	694
Lincoln	Bouteloua Barrens SNP	Large grassland	261
Livingston	Bissell Bluff SNA	Forest	563
	Newman's Bluff SNA	Federally listed plant site	169
Logan	Logan County Glade SNP	Rare plant site	42
	Raymond Athey Barrens SNP	Rare plant site	156
McCracken	Metropolis Lake SNP	Wetland	123
McCreary	Cumberland Falls SNP	Waterfalls and forest	1294
Muhlenberg	Cypress Creek SNP	Wetland	98
Powell	Natural Bridge SPNP	Forest, rock arches	1188
	Pilot Knob SNP	Geologic feature	742
Pulaski	Francis Johnson Palk SNP	Wetland/seep	150
Robertson	Blue Licks SPNP	Federally listed plant site	53
Rockcastle	John B. Stephenson SNP	Forest and waterfall	123
Simpson	Flat Rock Glade SNP	Rare plant site	99
Warren	Chaney Lake SNP	Transient lake	169
	Woodburn Glade SNP	Rare plant site	20
Whitley	Archer-Benge SNP	Forest, federally listed aquatic site	1864
TOTAL NUMBER OF COUNTIES			39
TOTAL NUMBER OF PRESERVES			64
TOTAL NUMBER OF ACRES			27,663

*CE indicates land protected by a conservation easement.

A directory of the state nature preserves is available upon request, or at <http://naturepreserves.ky.gov>.